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The geographical races of *Ixias pyrene* (Lepidoptera, Pieridae) mainly from the continental part of SE Asia, with special reference to intermediates between subspecies *latifasciata* and *verna*

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Abstract A pierid butterfly *Ixias pyrene* is taxonomically treated from India to Indo-China including the Malay Peninsula and southern China. It was divided into 10 subspecies in these areas. *Ixias pyrene yunnanensis* Fruhstorfer, 1902 and *I. pyrene fruhstorferi* Gabriel, 1943 are synonymized with *I. pyrene latifasciata* Butler, 1871, and *I. pyrene salangana* Fruhstorfer, 1910 and *I. pyrene annamitica* Fruhstorfer, 1910 are synonymized with *I. pyrene verna* Druce, 1874.

Key words *Ixias pyrene*, geographical variation, synonymy.

Introduction

The genus *Ixias* Hübner, 1819 contains medium-sized pierid butterflies, and is widely distributed from India and Sri Lanka, through China, Taiwan and the Malay Archipelago, to the Philippines. This genus is especially diverse on the islands and varies in wing ground color and color spots. Recently, Yata (1981) revised this genus, and provisionally divided it into 16 species. However, the ranges of species are not suitable and several problems are present, since they have large color variation and slight morphological differences of genital organs and plume-scales. I have been collecting data of *Ixias pyrene* (Linnaeus, 1764) mostly in Indo-China due to its taxonomic interest. This species is distributed from India through Indo-China to Malaysia. Gabriel (1943) recognized 20 subspecies in his revision, and Yata (1981) upgraded five out of them, *viz. insignis* from Taiwan, *clarki* from the Philippines, *weelei* from Wue I., *ludekingii* from Sumatra and *balice* from Java, to independent species based on the differences in androchonial scales and the genitalia, and following Gabriel (1943) he tentatively divided *pyrene* into 15 subspecies. In this paper, I recognize 10 subspecies from India, Indo-China, southern China and northern parts of the Malay Peninsula, synonymizing *familiaris*, *yunnanensis* and *fruhstorferi* with *latifasciata*, and *annamitica* and *salangana* with *verna*, although these five were treated as good subspecies in Gabriel (1943) and Yata (1981). I reexamined this species taxonomically on the basis of my collecting data, specimens including types preserved in the BMNH, and original descriptions. I report the results of the survey herein.

The following abbreviations are used in this paper: N—Nishimura Collection; BMNH—The Natural History Museum, London; DSF—dry season form; WSF—wet season form.

Taxonomic accounts of subspecies

Four subspecific taxa, *latifasciata* Butler, 1871, *familiaris* Butler, 1874, *yunnanensis* Fruhstorfer, 1902 and *fruhstorferi* Gabriel, 1943, have lemon yellow ground color on the upperside of

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the wings in males with an orange oblique band on the fore wing. They are distributed in Nepal, Sikkim, Bhutan, Assam, Myanmar, Thailand (northern parts), Laos, Vietnam (Tonkin and Annam) and China (Yunnan). The males of this group are usually smaller in the dry season, and larger in the rainy season. The rainy season males have a developed black portion in fore and hind wings, and some individuals possess a distinct black belt at the outer margin of the hind wing (Fig. 55). Females are much more variable than males; body size and color pattern are like those of males. The rainy season females are larger and darker than those of the dry season. The ground color of fore and hind wings varies from white, pale lemon yellow, lemon yellow, cream yellow to orange yellow, and the oblique band of the fore wing also varies from white, pale lemon yellow, pale orange yellow to orange (Fig. 56). Although the combination of color pattern between ground color and the oblique band varies, individuals with white ground color and white oblique band are very abundant in several regions.

Three subspecific taxa, *verna* Druce, 1874, *annamitica* Fruhstorfer, 1910 and *salangana* Fruhstorfer, 1910, have cream yellow ground color of the upperside of the wings with the orange oblique band on the fore wing in males. They are distributed in Myanmar (southern parts), Thailand (central and southern parts), Cambodia, Vietnam (southern parts) and Malaysia (Kedawi), and have small seasonal variations in body size and coloration. Females are polymorphic in coloration; ground color of wings varies from white, pale lemon yellow, cream yellow to pale orange yellow, and the oblique band of the fore wing is pale orange yellow to orange (Fig. 57). The combination of color pattern between the ground color and the fore wing oblique band varies.

After morphological comparisons among the populations, no subspecific differences were detected for *latifasciata*, *familiaris*, *yunnanensis* and *fruhstorferi* and they are regarded as a single subspecies (*latifasciata* is a valid name), and *verna, annamitica* and *salangana* are considered to form one independent subspecies (*verna* is a valid name) different from *latifasciata*.

Subspecies *sesia* (Fabricius, 1777) from S. India and *cingalensis* Moore, 1881 from Sri Lanka are comparatively small and the fore wing ground color is lemon yellow on the upperside, with the orange oblique band paler in the male. The nominotypical subspecies, *pyrene*, from S. China is generally larger like *latifasciata* from N. India to Central Indo-China through S. China, and individuals occurring in the rainy season are characteristic in their larger size as in *latifasciata*. The fore wing ground color is lemon yellow on the upperside and the fore wing oblique band is orange as in male *latifasciata*. Subspecies *verna* from Central to S. Indo-China and peninsular Malaysia is intermediate betweeen the *sesia-cingalensis* group and the *pyrene-latifasciata* group in size. The fore wing ground color is cream on the upperside and the fore wing oblique band is orange as in *latifasciata*. From the viewpoint of the fore wing coloration, *hainana* Fruhstorfer, 1910 from Hainan and *birdi* Distant, 1883 from the Malay Peninsula are contained in the *pyrene-latifasciata* group, and *alticola* Pendlebury, 1933 from the Malay Peninsula and *andamana* Moore, 1877 from Andaman are in the *verna* group.

Subspecies *evippe* (Drury, 1773) is widely distributed in Central and N. India, and its distribution range is close to that of *latifasciata* in the north and *sesia* in the south. Unfortunately, a fully comparative study was not achieved due to the shortage of material. For the same reason, the full comparisons of *pyrene*, *hainana*, *birdi*, *alticola* and *andamana* were not made.

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The above-mentioned color forms are summarized as follows.

Lemon yellow form (yellow form of Gabriel, 1943: 55)—*cingalensis*, *sesia*, *latifasciata*, *hainana*, *pyrene*, *birdi*, *evippe*.

Cream yellow form (white form of Gabriel, 1943: 55)—*verna*, *andamana*, *alticola*.

The distributional records of which the specimens were examined by me are shown in Fig. 59.

Geographical variation

As mentioned above, I treat the populations of Nepal, Sikkim, Bhutan, Assam, Myanmar, Thailand (Northern parts), Laos, Vietnam (Tonkin and Annam), and China (Yunnan) as a single subspecies, *latifasciata*, since no morphological differences were marked among the populations in those areas.

Individuals from northern Vietnam are slightly larger and much darker than the other individuals. The ratio of female individuals which possess white ground color on the wings and white oblique fore wing spots (white-form) varies between regions. The following results are given from the material preserved in BMNH (number of white form/number of female specimens examined).

Darjeeling (DSF: 3 exs/7 exs. WSF: 8 exs/8 exs), Sikkim (DSF: 14 exs/14 exs. WSF: 5 exs/5 exs), Pedong (DSF: 1 ex./1 ex. WSF: 2 exs/2 exs), Bhutan (DSF: 1 ex./2 exs. WSF: 9 exs/9 exs), Assam (DSF: 0/10 exs. WSF: 3 exs/3 exs), Mishmi Hills (DSF: 0/3 exs), Manipur (DSF: 0/2 exs. WSF: 0/4 exs), Bhamo (WSF: 0/8 exs), Yunnan (DSF: 0/3 exs. WSF: 0/23 exs).

The white form is relatively commonly found in Darjeeling, Sikkim, Bhutan and much more rarely found in Assam. In the areas east and south of those areas, the white form was not found. The other females, excluding the white form, have large variations and no remarkable pattern of geographic variation is found. It is possible that *latifasciata* is a synonym with *pyrene* from S. China. Little information about geographic variation has been obtained from China, so I tentatively separate them here. The specimens of *pyrene* which I examined are 2 males only from Fujian, Mt Wuyi-Shan. The orange band on the fore wing of these specimens is large, and the black spot on the discocellular bar is small diverging from the inner black line. In their illustrated book, Johnston & Johnston (1980) show male individual from Hong Kong which largely resembles the Fujian specimens. However, inner black line of discocellular bar in the Fujian specimens is weaker than that of the Hong Kong specimen. In the females, interestingly, an individual which resembles the white form, but has a slightly yellow colored oblique band on the fore wing, is also shown in Johnston & Johnston (1980). Recently, Bascombe *et al.* (1999) illustrated the males and females of the dry season form and the rainy season form (pl. 35). The male of the dry season has a small discocellular black bar and it resembles the male figured in Johnston & Johnston (1980). Bascombe *et al.* (1999) also illustrated a female with white ground color on the upperside of wings (fig. 7. 30). Further study is needed to determine whether these characters of both sexes are characteristic in this area or continuous to Indo-China.

The males of *hainana* (type specimens) are characteristic. The oblique band of the fore wing is broader and cloudy orange. In *verna*, this character appears relatively commonly, while in *latifasciata* it rarely occurs.

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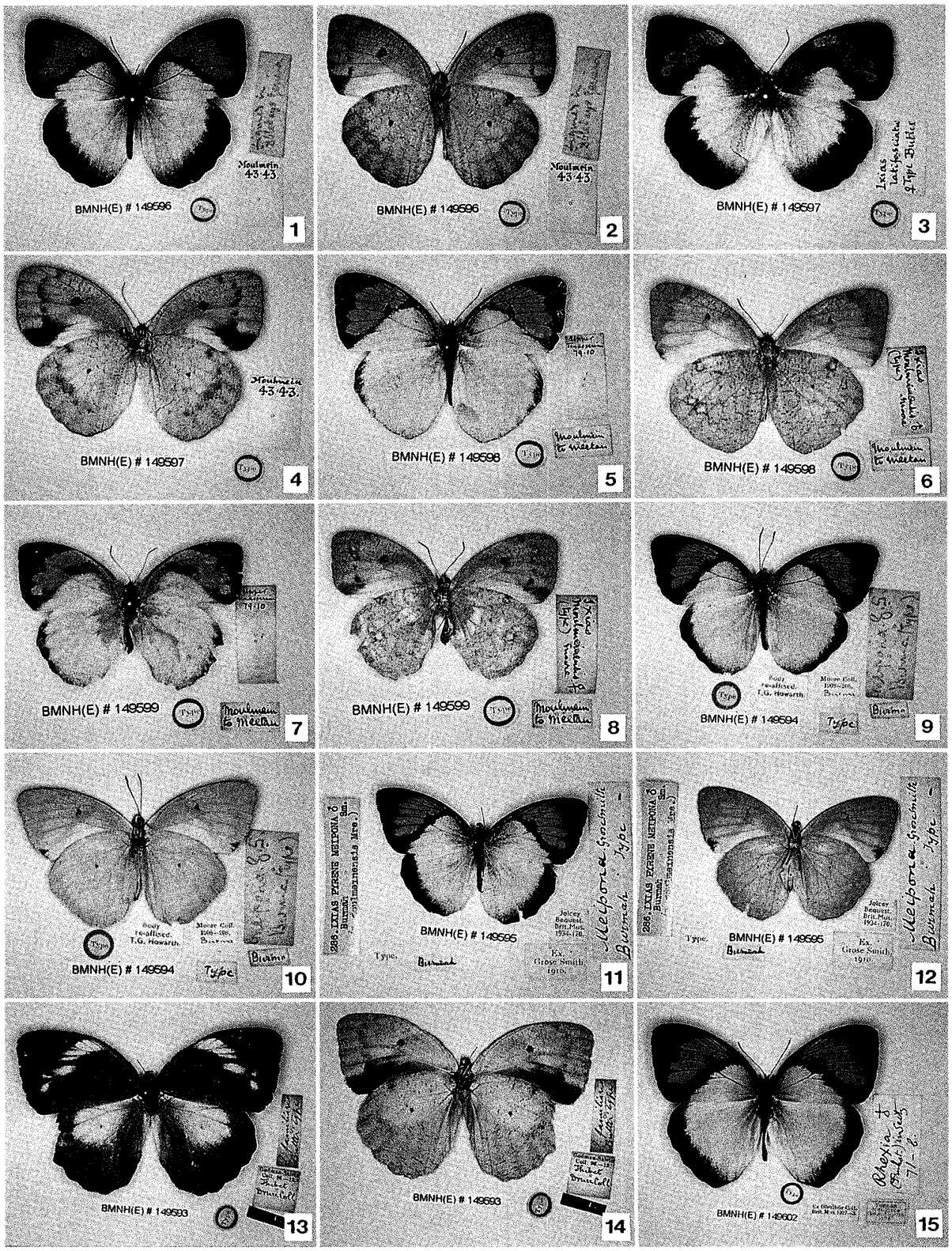

Figs 1–15. Type specimens of *Ixias pyrene* subspecies preserved in BMNH. 1. *I. latifasciata* Butler, syntype ♂. 2. *Ditto*, underside. 3. *Ditto*, syntype ♀. 4. *Ditto, underside*. 5. *I. moulmeinensis* Moore, syntype ♂. 6. *Ditto*, underside. 7. *Ditto*, syntype ♀. 8. *Ditto*, underside. 9. *I. p. meipona* Grose-Smith, syntype ♂. 10. *Ditto*, underside. 11. *Ditto*, syntype ♂. 12. *Ditto*, underside. 13. *I. familiaris* Butler, syntype ♀. 14. *Ditto*, underside. 15. *I. p. yunnanensis* Fruhstorfer, syntype ♂.

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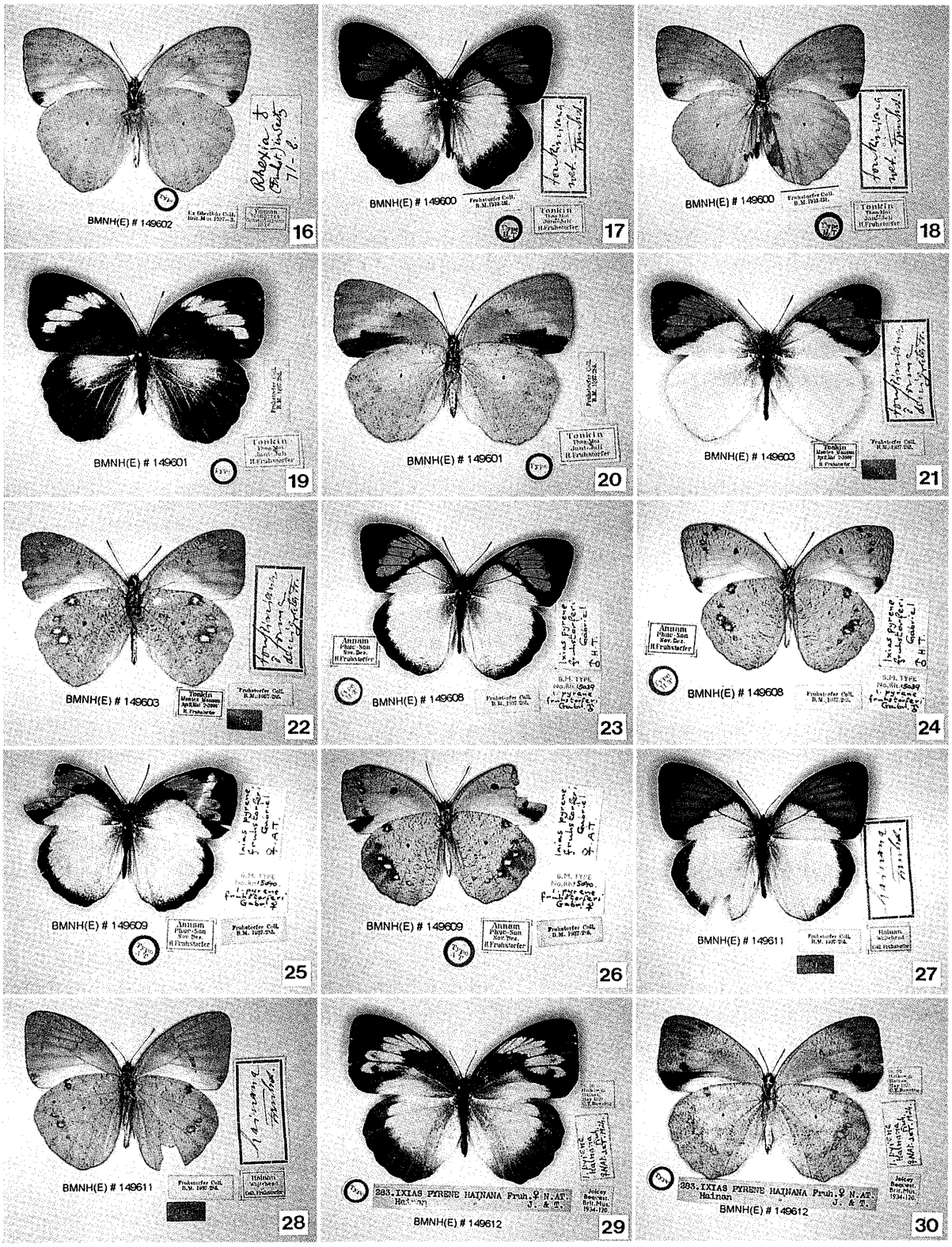

Figs 16–30. Type specimens of *Ixias pyrene* subspecies preserved in BMNH. 16. *I. p. yunnanensis* Fruhstorfer, syntype ♂, underside. 17. *I. p. tonkiniana* Fruhstorfer, holotype ♂. 18. *Ditto*, underside. 19. *Ditto*, syntype ♀. 20. *Ditto*, underside. 21. *I. p. tonkiniana*, f. *denigrata* Fruhstorfer, syntype ♂. 22. *Ditto*, underside. 23. *I. p. fruhstorferi* Gabriel, holotype ♂. 24. *Ditto*, underside. 25. *Ditto*, allotype ♀. 26. *Ditto*, underside. 27. *I. p. hainana* Fruhstorfer, syntype ♂. 28. *Ditto*, underside. 29. *Ditto*, syntype ♀. 30. *Ditto*, underside.

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Although Yata (1981) indicated 3 subspecies from the Malay Peninsula, his *verna* (pl. 22, figs 1-4) differs from the typical specimens. The types (Figs 35-38) have cream yellow ground color on the upperside of the wings. The same individuals were taken at Satun, the westernmost town of the peninsula part of Thailand. The male specimen presented by Yata (1981) rather resembles *birdi*. As for the distribution of the 3 subspecies in the Malay Peninsula, *verna* is distributed from the northern parts of Peninsula to Kedah, *birdi* has a narrow distributional range from southern Kedah to Perak, and *alticola* is a highland subspecies distributed in the mountainous regions (*e. g.* Fraser's Hill) more than 3,000 feet (Corbet & Pendlebury, 1934). Further, *birdi* is found in forest glades on the lowlands, and *alticola* is found in open areas and often seen flying along the roadside (Corbet & Pendlebury, 1934). In my observation at Satun in Thailand, *verna* is found in sunny areas and often flies along the roadside. In short, the habitats of *latifasciata* and *birdi* are forests and *verna* and *alticola* are open areas.

Intermediates between *latifaciata* and *verna*

Ixias pyrene is divided into 2 groups in Nepal, Sikkim, Bhutan, Assam, Myanmar, Thailand, Laos, Cambodia, Vietnam, China (Yunnan), and these two groups are tentatively regarded as subspecies, that is *latifasciata* and *verna*. However, relationships between *latifasciata* and *verna* are not strongly confirmed. According to observation by Corbet & Pendlebury (1934) in the Malay Peninsula, the lemon yellow form (ssp. *birdi*) was said to inbabit the forest paths on the plains and the cream yellow form (ssp. *alticola*) to inhabit the open country. I also observed the same phenomenon in Laos, where the two forms are replaced by sspp. *latifasciata* and *verna*, respectively. The differences of habitat preference between them also suggest that they are separate subspecies from each other, or merely a phenotypic difference within a single subspecies. Moreover, an intermediate population between them is recognized in Bolovens Plateau in southern Laos and Thakek in central Laos (Fig. 58), and both areas are inhabited by three populations, *latifasciata, verna* and intermediate. Both of Bolovens Plateau and Thakek are deforested areas or sunny woodland areas. Laos was originally a forest country, but now forest fragmentation has been accelerated, and insect species composition also has been changed along with the environmental change. The presence of an intermediate population between 2 subspecies of *Ixias pyrene* may well be related to those environmental changes. As for the distribution of the 2 subspecies in Indo-China, *verna* is distributed in central and southern parts, and *latifasciata* is distributed around *verna*'s distribution area in a reversed U-shape. The distributional range of *latifasciata* also overlaps with forest areas. *Latifasciata* is a forest subspecies and found from forests to forest margins, while *verna* is found in sunny woods or bushes, and also found at open sites like roadsides. *Verna* may spread its distributional range to newly appeared areas disturbed by human activities. Therefore, it can be said that *latifasciata* is a wet forest form and *verna* is a dry open land form. Two hypotheses should be considered for the presence of the intermediate population. One is that two subspecies, woodland and dry area types, are formed from a common ancester of those two subspecies separated from each other in habitat deforestation. As a result of environmental disruption, the habitat of *latifasciata* had mostly been changed and *verna* had invaded those deforested areas, and they mated and produced intermediate offspring. The other is that following the changing of the forest environment, a subspecies adapted to the open areas, that is *verna*, was evolved from the forest type subspecies, *latifasciata*. If on the other hand the phenotypes of wing ground color and wing spots of *verna* and *latifasciata* are affected by environmental factors such as woodland or open dry area, those characteristics of *verna* and *latifasciata* may be not stable, and they

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should not be regarded as subspecies different from each other. Considering the deforestation in Laos, it is possible that those phenotype changes were caused in a short time. The addition of new informations, especially the molecular data, will contribute to solving this problem.

Male genitalia

Male genital organs of individuals taken from Doi Phu Kha (Nan Province, Thailand) and Mae Mo (Lampang Province, Thailand) are shown in Figs 60A, B. The individuals from the following localities are also examined and compared: India—Nilgiri Hills, Teesta, Khasi Hills. Myanmar—Myitkyina. Thailand—Chiang Dao, Umphang, Padeng, Kampuang, Namtok Than To. Laos—Vang Vieng, Xam Neua, Namtok Wairushi, Ban Lao. Vietnam— Cuc Phuong, Phu Huu.

The morphological differences among the individuals were slight, and no geographical variation is shown. Larger individuals tend to have larger genitalia.

List of subspecies and material examined

The subspecific status of three isolated populations, Sri Lanka, the Andamans and Hainan I., is acceptable, but the boundaries between every subspecies in the continental part need to be investigated in full detail in the future. Here I follow Yata (1981) except for *latifasciata* and *verna*.

Ixias pyrene pyrene (Linnaeus, 1764)

Papilio pyrene Linnaeus, 1764, *Mus. Lud. Ulr.*: 241.

Ixias pyrene Hübner, 1819, *Verz. bekannter. Schmett.*: 95; Talbot, 1947, *Fauna Br. India* (Butterflies) **2** (Edn 2): 443; Wynter-Blyth, 1957, *Butterflies Indian Region*: 437, pl. 65; Johnston & Johnston, 1980, *Hong Kong Butterflies*: 178; D'Abrera, 1982, *Butterflies Oriental Region* **1**: 164; Yata, 1981, *in* Tsukada, *Butterflies South East Asian Islands* **2**: 280; Bascombe *et al.*, 1999, *Butterflies Hong Kong*: 183, 380, pl. 35, figs 5–13.

Ixias pyrene pyrene: Gabriel, 1943, *Proc. R. ent. Soc. Lond.* (B) **12**: 62; Chou *et al.*, 1994, *Monographia Rhopalocerorum Sinensium*: 230.

Specimens examined. CHINA—Fujian, Mts Wuyi Shan: 2 ♂, iv. 1995 (N).

Distribution. Southern China.

Ixias pyrene latifasciata Butler, 1871 (Figs 1–26)

Ixias latifasciata Butler, 1871, *Proc. zool. Soc. Lond.* **1871**: 252, pl. 19, fig. 3 (Figs 1–4); D'Abrera, 1982, *Butterflies Oriental Region* **1**: 164.

Ixias pyrene latifasciata: Fruhstorfer, 1910, *in* Seitz, *Gross-Schmett. Erde* **9**: 159, pl. 71, row e; Gabriel, 1943, *Proc. R. ent. Soc. Lond.* (B) **12**: 59; Talbot, 1947, *Fauna Br. India* (Butterflies) **2** (Edn 2): 447; Yata, 1981, *in* Tsukada, *Butterflies South East Asian Islands* **2**: 280.

Ixias moulmeinensis Moore, 1877, *Ann. Mag. nat. Hist.* (4) **20**: 49. (Figs 5–8)

Ixias pyrene latifasciata f. *moulmeinensis*: Fruhstorfer, 1910, *in* Seitz, *Gross-Schmett. Erde* **9**: 159, pl. 72, row a.

Ixias pyrene meipona Grose-Smith, 1887, *Ann. Mag. nat. Hist.* (5) **19**: 296. (Figs 9–12)

Ixias familiaris Butler, 1874, *Trans. ent. Soc. Lond.* **1874**: 432. **Syn. nov.** (Figs 13, 14)

Ixias pyrene familiaris: Gabriel, 1943, *Proc. R. ent. Soc. Lond.* (B) **12**: 59; Talbot, 1947, *Fauna Br. India*

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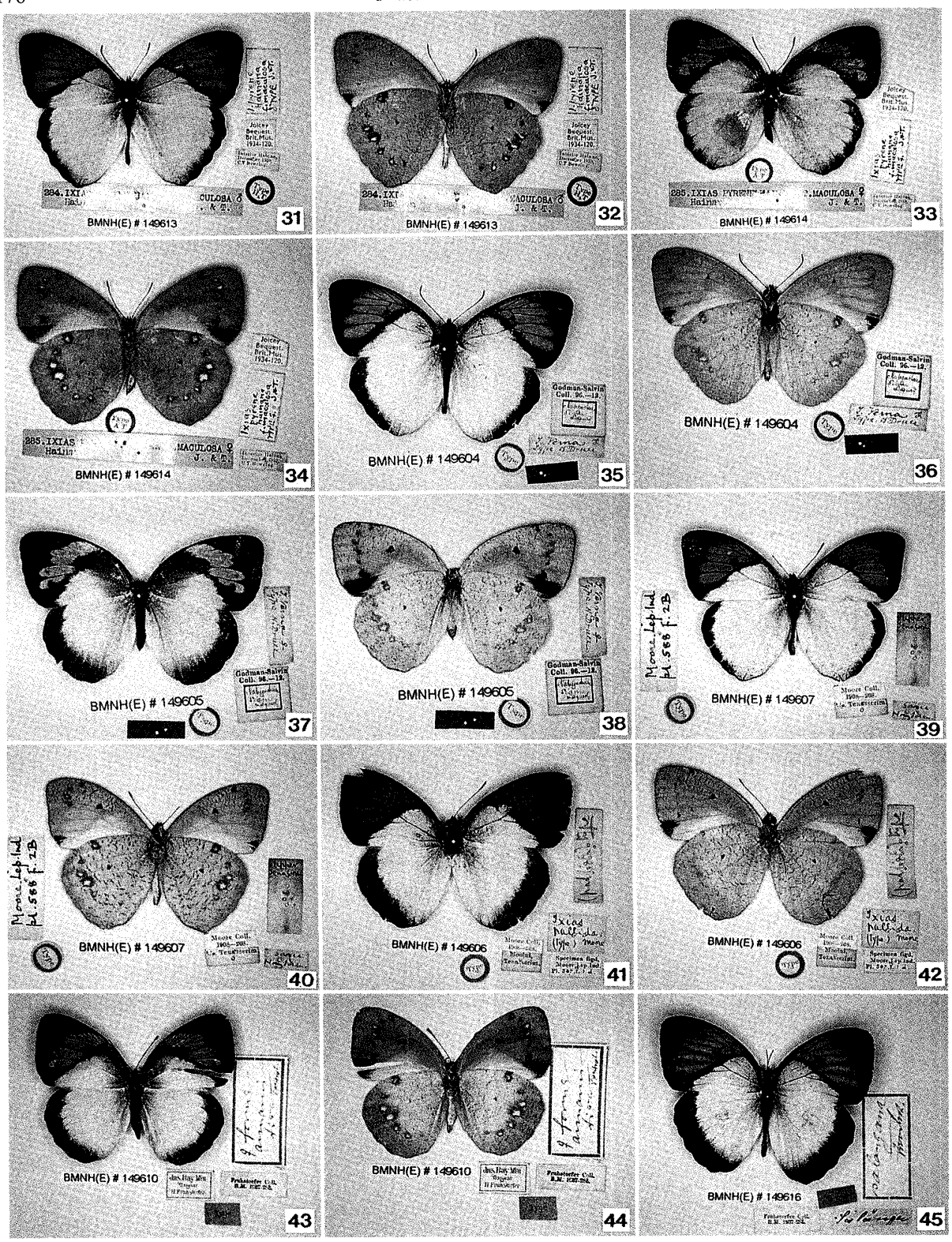

Figs 31–45. Type specimens of *Ixias pyrene* subspecies preserved in BMNH. 31. *I. p. hainana*, f. *maculosa* Joicey & Talbot, holotype ♂. 32. *Ditto*, underside. 33. *Ditto*, allotype ♀. 34. *Ditto*, underside. 35. *I. verna* Druce, syntype ♂. 36. *Ditto*, underside. 37. *Ditto*, syntype ♀. 38. *Ditto*, underside. 39. *I. citrina* Moore, syntype ♂. 40. *Ditto*, underside. 41. *I. pallida* Moore, syntype ♂. 42. *Ditto*, underside. 43. *I. p. annamitica* Fruhstorfer, syntype ♀. 44. *Ditto*, underside. 45. *I. p. salangana* Fruhstorfer, syntype ♂.

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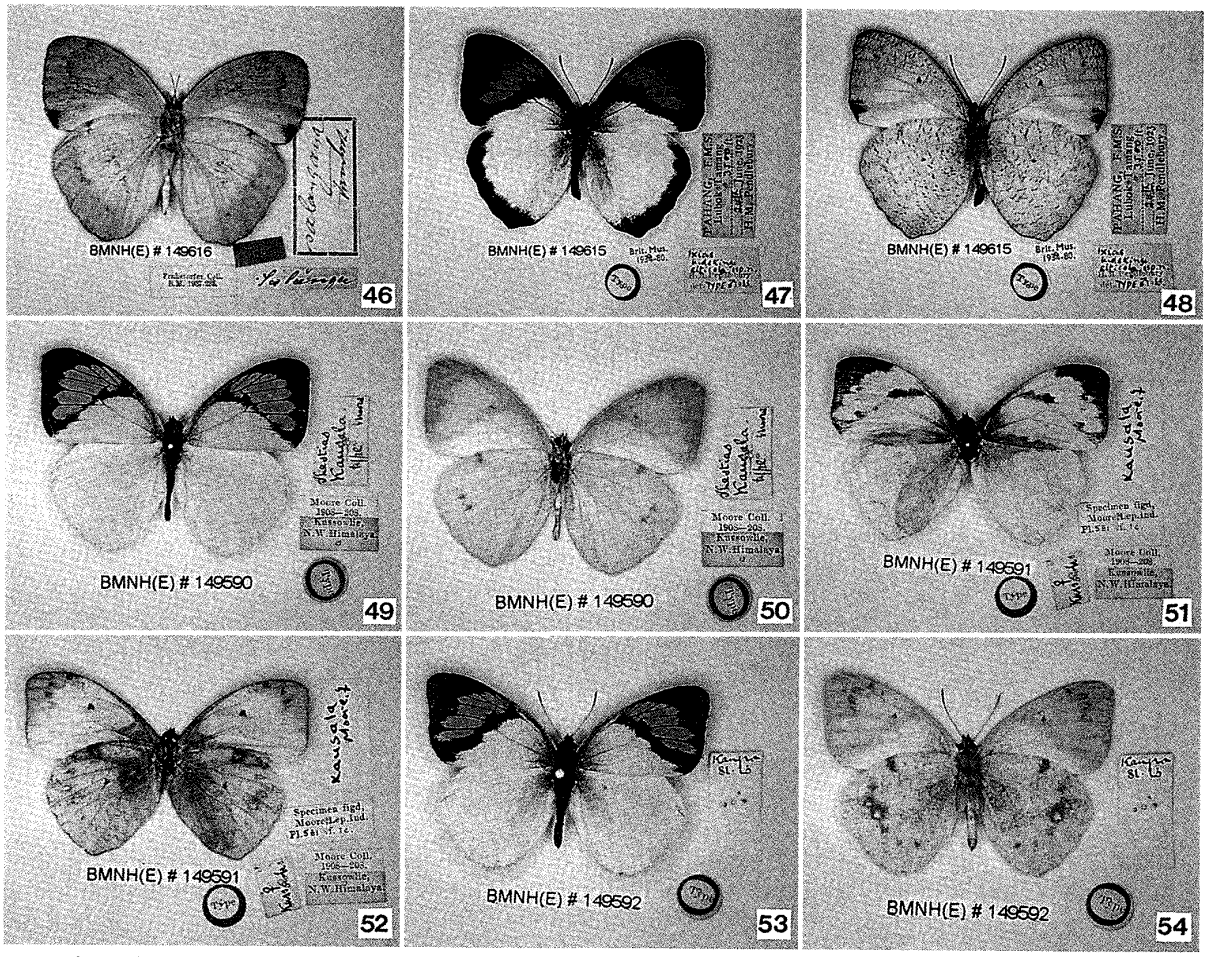

Figs 46–54. Type specimens of *Ixias pyrene* subspecies preserved in BMNH. 46. *I. p. salangana* Fruhstorfer, syntype ♂, underside. 47. *I. p. alticola* Pendlebury, syntype ♂. 48. *Ditto*, underside. 49. *I. kausala* Moore, syntype ♂. 50. *Ditto*, underside. 51. *Ditto*, syntype ♀. 52. *Ditto*, underside. 53. *I. pygmaea* Moore, syntype ♂. 54. *Ditto*, underside.

(Butterflies) **2** (Edn 2): 447; Yata, 1981, *in* Tsukada, *Butterflies South East Asian Islands* **2**: 280.

Ixias pyrene yunnanensis Fruhstorfer, 1902, *Soc. ent.* **17** (11): 82; Gabriel, 1943, *Proc. R. ent. Soc. Lond.* (B) **12**: 60; Yata, 1981, *in* Tsukada, *Butterflies South East Asian Islands* **2**: 280; Motono & Negishi, 1989, *Butterflies Laos*: 50, pls 23, 24; Koiwaya, 1989, *Studies Chinese Butterflies* **1**: 82, pl. 45; Chou *et al.*, 1994, *Monographia Rhopalocerorum Sinensium*: 230; Osada *et al.*, 1999, *Illust. Checklist Butterflies Laos*: 90. **Syn. nov.** (Figs 15, 16)

Ixias pyrene tonkiniana Fruhstorfer, 1902, *Dt. ent. Z. Iris* **15**: 297; Yata, 1981, *in* Tsukada, *Butterflies South East Asian Islands* **2**: 280. (Figs 17–20)

Ixias pyrene tonkiniana, f. *denigrata* Fruhstorfer, 1910, *in* Seitz, *Gross-Schmett. Erde* **9**: 159, pl. 71, row e. Unavailable by an infrasubspecific name. (Figs 21, 22)

Ixias pyrene fruhstorferi Gabriel, 1943, *Proc. R. ent. Soc. Lond.* (B) **12**: 61; Yata, 1981, *in* Tsukada, *Butterflies South East Asian Islands* **2**: 280. **Syn. nov.** (Figs 23–26)

Thestias rhexia: Butler, 1869, *Cat. Fabr. Lepid.*: 216, pl. 1, fig. 5, *nec* Fabricius, 1775.

Ixias pyrene, f. *rhexia*: Röber, 1907, *in* Seitz, *Gross-Schmett. Erde* **1**: 58, pl. 23, row g, *nec* Fabricius, 1775; Fruhstorfer, 1910, *in* Seitz, *Gross-Schmett. Erde* **9**: 159, pl. 71, rows b, c, *nec* Fabricius, 1775.

Specimens examined. INDIA—West Bengal State, Teesta: 1 ♂, 15. vi. 1992 (N). West Bengal State, Darjeeling: 14 ♂ 11 ♀ (BMNH); 1 ♀, 3. vi. 1992 (N); 1 ♂, 11. vi. 1992 (N). Maghalaya State, Khasi Hills: 1 ♂, iii. 1977 (N). Sikkim: 23 ♂ 19 ♀ (BMNH). Assam:

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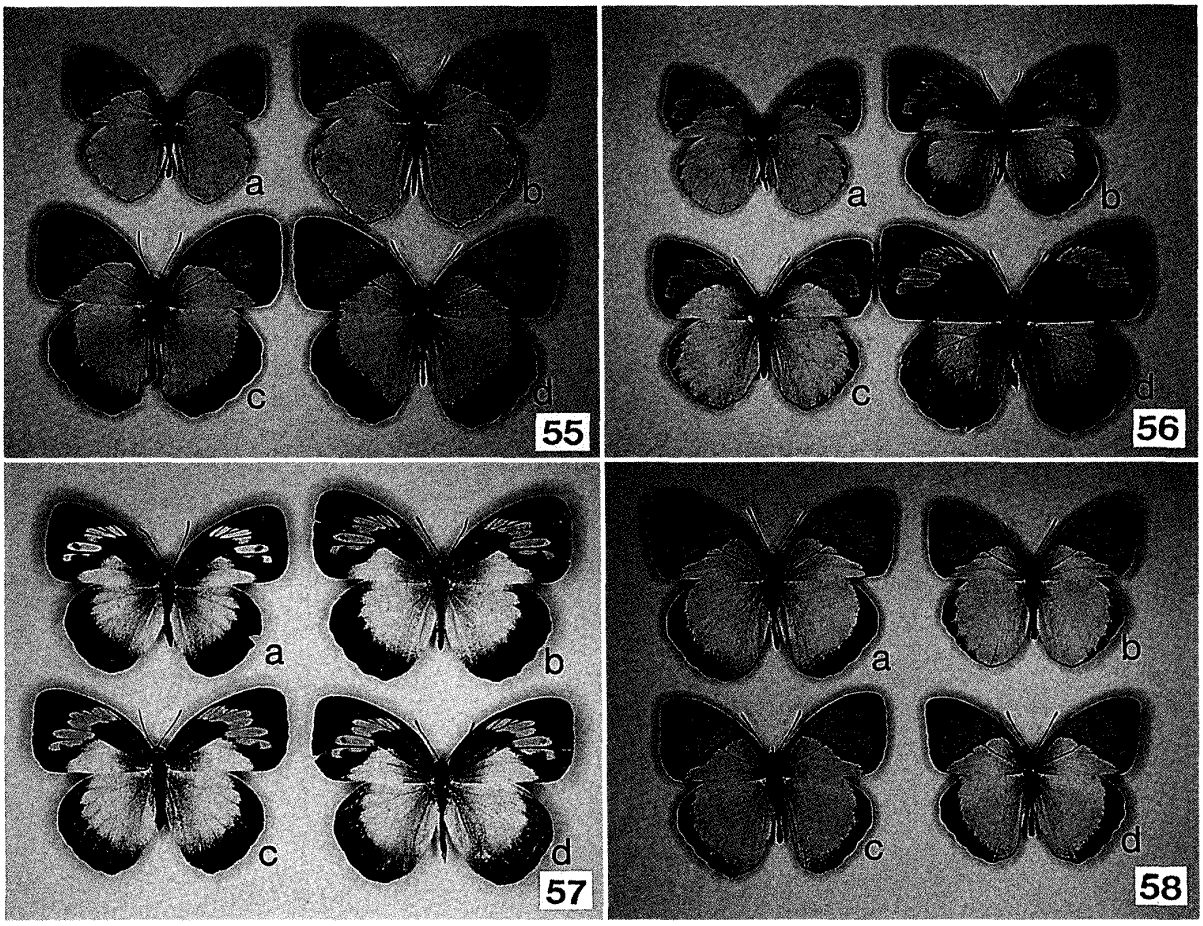

Fig. 55. Seasonal variation of male of *Ixias pyrene latifasciata*. a. Chiang Dao (DSF). b. Cuc Phuong (DSF). c. Chiang Dao (WSF). d. Cuc Phuong (WSF).
Fig. 56. Seasonal variation of female of *Ixias pyrene latifasciata*. a. Doi Pha Hompok (DSF). b. Cuc Phuong (WSF). c. Pua (DSF). d. Cuc Phuong (WSF).
Fig. 57. Individual variation of *Ixias pyrene verna*. a-d. Wang Lung, 21. vi. 1993 (N).
Fig. 58. Intermediates between *latifaciata* and *verna*. a-d. Thakhek, 4. iii. 1998 (N).

29 ♂ 17 ♀. Nagaland: 6 ♂ (BMNH). Manipur: 2 ♂ 6 ♀ (BMNH). Mishmis Hills: 7 ♂ 3 ♀ (BMNH). NEPAL—Kathmandu: 4 ♂ (BMNH). [Nepal: 5 ♂ (BMNH)]. BHUTAN—[Bhutan: 13 ♂ 11 ♀ (BMNH)]. MYANMAR—Sagaing State, Angpawng Bum: 1 ♂ 3 ♀, 3. ix. 1997 (N); 1 ♀, 10. x. 1997 (N). Kachin State, Myitkyina: 1 ♂, ii. 1996 (N); 1 ♂, 22. ix. 1996 (N). Kachin State, Bhamo: 5 ♂ 8 ♀ (BMNH). 1 ♂ 1 ♀ (syntypes of *latifasciata*), labeled "Moulmein, 43-43" (BMNH). 1 ♂ 1 ♀ (syntypes of *moulmeinensis*), labeled "Upper Tenasserim, 79. 10, Moulmein to Meetan" (BMNH). 1 ♂ (syntype of *meipona*), labeled "Burma, Moore Coll., 1908-208" (BMNH). 1 ♂ (syntype of *meipona*), labeled "Burma, Joicey Bequest. Brit. Mus. 1934-120" (BMNH). [Upper Burma: 13 ♂ 7 ♀ (BMNH)]; [Lower Burma: 37 ♂ 28 ♀ (BMNH)]. THAILAND—Chiang Mai Province, Doi Pa Hom Pok: 1 ♂, 28. iii. 1990 (N); 1 ♀, 7. iii. 1991 (N); 1 ♀, 5. iv. 1991 (N). Chiang Mai Province, Samoeng: 3 ♂, 20. x. 1990 (N). Chiang Mai Province, Chiang Dao: 6 ♂, iv. 1984 (N); 5 ♂, 7. ii. 1989; 4 ♂, 15. iii. 1993 (N); 2 ♂, 20. vi. 1993 (N); 2 ♂, 24. ii. 1994 (N). Nan Province, Pua: 2 ♂, 18. ix. 1989 (N); 3 ♂, 14. iii. 1990 (N); 1 ♂, 5. vi. 1990 (N); 7 ♂, 7. iv. 1991 (N); 2 ♂, 20. iv. 1991 (N). LAOS—Houa Phan Province, Xam Neua: 1 ♂, 21. vi. 1991 (N); 2 ♂, 10. viii. 1991 (N). Viang Chan Province,

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Vang Vieng: 2 ♂, 31. viii. 1990 (N); 1 ♂, 16. vi. 1991 (N); 2 ♂, 9. iii. 1998 (N). Viang Chan Province, Ban Na Ruwang: 2 ♂, 10. iii. 1998 (N). Xiang Khoang Province, Ban Nok: 1 ♂, 17. iii. 1994 (N). Xiang Khoang Province, Ban Nam Hom: 1 ♂, 18. iii. 1994 (N). Xaigna Bouri Province, Doi Pee Ban Nam: 1 ♂, 25. iii. 1990 (N). Luang Nam Tha Province, Nam Ha: 4 ♂, 17. iii. 1999 (N). Luang Nam Tha Province, Namtok Nam Di: 4 ♂, 18. iii. 1999 (N). VIETNAM—Ha Nam Ninh Province, Cuc Phuong: 3 ♂, 13. vii. 1992 (N); 3 ♂, 23. vi. 1995 (N); 6 ♂ 2 ♀, 27. v. 1996 (N); 1 ♀, 18. 1997 (N): 6 ♂ 1 ♀, 29. xi. 1997 (N). 1 ♂ (syntype of *tonkiniana*), labeled "Tonkin, Than Moi, June-Juli, H. Fruhstorfer" (BMNH). 1 ♀ (syntype of *tonkiniana*), labeled "Tonkin, Than Moi, June-Juli, H. Fruhstorfer" (BMNH). 1 ♂ (holotype of *fruhstorferi*), labeled "Annam, Phuc-Son, Nov. Dec., H. Fruhstorfer" (BMNH). 1 ♀ (allotype of *fruhstorferi*), labeled "Annam, Phuc-Son, Nov. Dec., H. Fruhstorfer" (BMNH). 1 ♂ (syntype of *denigrata*), labeled "Tonkin, Montes Mauson, April. Mai, H. Fruhstorfer" (BMNH). CHINA—Yunnan: 21 ♂ 26 ♀ (BMNH). 1 ♀ (syntype of *familiaris*), labeled "Thibet, Godman-Salvin Coll. 96.-12." (BMNH). 1 ♂ (syntype of *yunnanensis*), labeled "Yunnan, Mengizee, Chasseurs Japonais, 1894, *Ex* Oberthur Coll." (BMNH).

Distribution. Nepal, Sikkim, Assam, Bhutan, Northern and Central Myanmar, Northern Thailand, Northern Laos, Northern Vietnam, Yunnan.

Ixias pyrene hainana Fruhstorfer, 1910 (Figs 27–34)

Ixias pyrene hainana Fruhstorfer, 1910, *in* Seitz, *Gross-Schmett. Erde* **9**: 158; Gabriel, 1943, *Proc. R. ent. Soc. Lond.* (B) **12**: 62; Yata, 1981, *in* Tsukada, *Butterflies South East Asian Islands* **2**: 280; Chou *et al.*, 1994, *Monographia Rhopalocerorum Sinensium*: 230. (Figs 27–30)

Ixias pyrene hainana f. *maculosa* Joicey & Talbot, 1924, *Bull. Hill Mus.* **1**: 529. Unavailable by an infrasubspecific name. (Figs 31–34)

Specimens examined. CHINA—Hainan: 1 ♂ (syntype of *hainana*), labeled "Hainan, Whitehead, Coll. Fruhstorfer" (BMNH). 1 ♀ (syntype of *hainana*), labeled "Hoihow, Hainan, May 1920, C. T. Bowring" (BMNH). 1 ♂ (holotype of *maculosa*), labeled "Interior Hainan, December 1919, C. T. Bowring" (BMNH); 1 ♀ (allotype of *maculosa*), labeled "Interior Hainan, December 1919, C. T. Bowring" (BMNH).

Distribution. Hainan.

Ixias pyrene verna Druce, 1874 (Figs 35–46)

Ixias verna Druce, 1874, *Proc. zool. Soc. Lond.* **1874**: 108, pl. 16, figs 5, 6; D'Abrera, 1982, *Butterflies Oriental Region* **1**: 165. (Figs 35–38).

Ixias pyrene verna: Corbet, 1937. *Proc. R. ent. Soc. Lond.* (B) **6** (3): 49; Fruhstorfer, 1910, *in* Seitz, *Gross-Schmett. Erde* **9**: 159, pl. 71, row e; Gabriel, 1943, *Proc. R. ent. Soc. Lond.* (B) **12**: 60; Talbot, 1947, *Fauna Br. India* (Butterflies) **2** (Edn 2): 448; Corbet & Pendlebury, 1934, *Butterflies Malay Peninsula*: 92, pl. 9; Yata, 1981, *in* Tsukada, *Butterflies South East Asian Islands* **2**: 280, pl. 22; Pinratana, 1983, *Butterflies Thailand* **2**: 21, pl. 16; Motono & Negishi, 1989, *Butterflies Laos*: 12, pl. 24; Chou *et al.*, 1994, *Monographia Rhopalocerorum Sinensium*: 230; Osada *et al.*, 1999, *Illust. Checklist Butterflies Laos*: 90.

Ixias citrina Moore, 1879 ["1878"], *Proc. zool. Soc. Lond.* **1878**: 837. (Figs 39, 40)

Ixias pallida Moore, 1879 ["1878"], *Proc. zool. Soc. Lond.* **1878**: 837. (Figs 41, 42)

Ixias pyrene annamitica Fruhstorfer, 1910, *in* Seitz, *Gross-Schmett. Erde* **9**: 158; Gabriel, 1943, *Proc. R. ent. Soc. Lond.* (B) **12**: 62; Yata, 1981, *in* Tsukada, *Butterflies South East Asian Islands* **2**: 280. **Syn. nov.** (Figs 43, 44)

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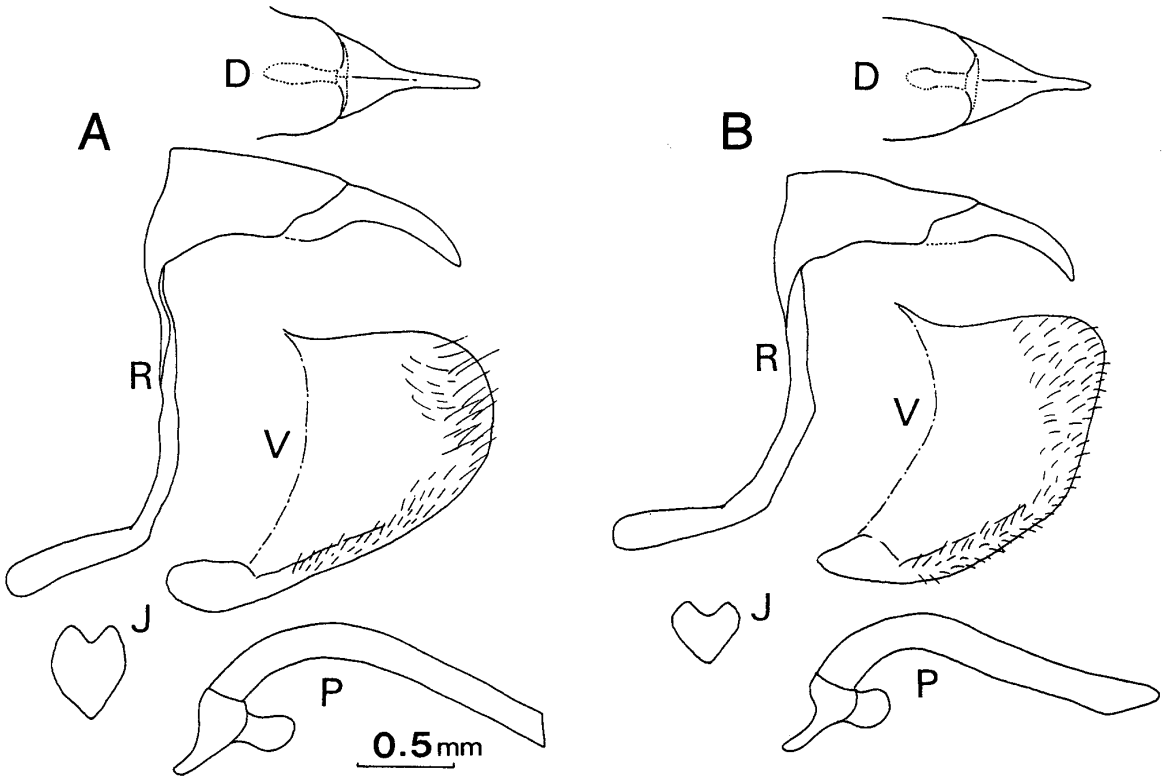

Fig. 60. Male genitalia of *Ixias pyrene* subspecies. A. *I. p. latifasciata*. Doi Phu Kha, Thailand. B. *I. p. verna*. Mae Mo, Thailand. (D: dorsum, R: rings, V: valva, P: phallus, J: juxta).

Ixias pyrene salangana Fruhstorfer, 1910, *in* Seitz, *Gross-Schmett. Erde* **9**: 159, pl. 72, row c; Gabriel, 1943, *Proc. R. ent. Soc. Lond.* (B) **12**: 63; Yata, 1981, *in* Tsukada, *Butterflies South East Asian Islands* **2**: 280. **Syn. nov.** (Figs 45, 46)

Specimens examined. MYANMAR—Karen Hills: 12 ♂ 3 ♀ (BMNH). Tanasserim: 6 ♂ 5 ♀ (BMNH). 1 ♂ (syntype of *citrina*), labeled "Upper Tenasserim, Moore Coll. 1908-208" (BMNH). 1 ♂ (syntype of *pallida*), labeled "Moolai, Tenasserim, Moore Coll. 1908-208" (BMNH). THAILAND—Chiang Mai Province, San Sai: 1 ♂, 23. iii. 1993 (N); 1 ♂ 2 ♀, 3. vi. 1993 (N). Chiang Mai Province, Wang Lung: 19 ♂ 9 ♀, 21. vi. 1993 (N). Lumphun Province, Doi Chang: 1 ♂, 22. vi. 1993 (N). Lampang Province, Mae Tha: 3 ♂ 2 ♀, 7. vi. 1991 (N). Lampang Province, Mae Mo: 3 ♂,18. iii. 1993 (N). Phrae Province, Wang Chin: 1 ♂, 2. vi. 1992 (N). Phrae Province, Namtok Mae Kam: 3 ♂, 9. iii. 1993 (N). Tak Province, Umphang: 1 ♂, 12. iii. 1994 (N); 2 ♂, 17. iii. 1997 (N); 4 ♂, 2. v. 1997 (N). Phetchaburi Province, Padeng: 5 ♂, 21. iii. 1992 (N); 2 ♀, 3. vi. 1992 (N). Phang Nga Province, Kampuang: 1 ♂ 1 ♀, 5. vi. 1992 (N). Phang Nga Province, Sa Nangmanora: 1 ♀, 9. ii. 1999 (N). Phuket Island, Namtok Kathu: 4 ♂, 13. ii. 1999 (N). Hat Yai Province, Namtok Ton Nga Chang: 1 ♂, 9 .iii. 1994 (N). Satun Province, Thale Ban: 4 ♂ 1 ♀, 5. ii. 1999 (N). Yala Province, Namtok Than To: 2 ♂, 2. iii. 1994 (N). 1 ♂ 1 ♀ (syntypea of *verna*), labeled "Nahcon ? ?, Siam, Godman-Salvin Coll. 96.-12." (BMNH). 1 ♂ (syntype of *salangana*), labeled "Salanga, Fruhstorfer Coll." (BMNH). LAOS—Vientiane Prefecture, Ban Nakha: 2 ♂; 26. vi. 1999 (N). Bolikhamsai Province, Lak Sao: 2 ♂, 2. iv. 1996 (N). VIETNAM—Khanh Hoa Province, Nha Trang, Sui Hiep: 5 ♂, 24. v. 1992 (N). Khanh Hoa Province, Nha Trang, Phu Huu: 6 ♂, 23. v. 1992 (N).

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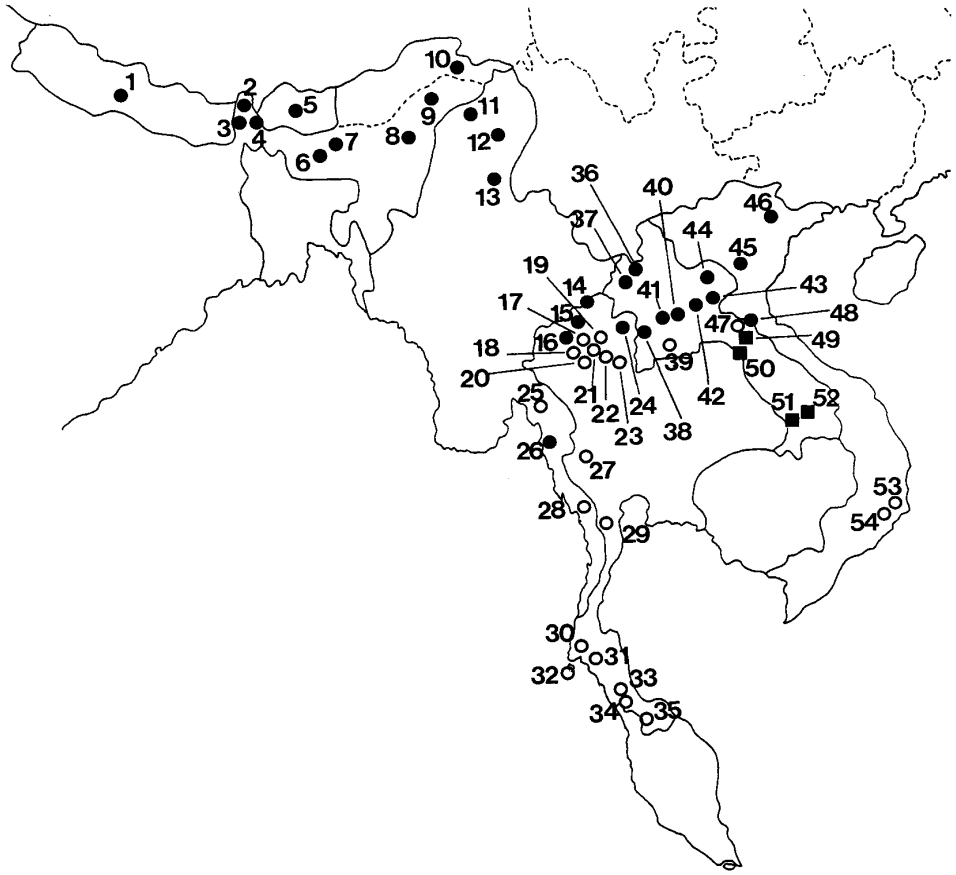

Fig. 59. Collecting sites of *Ixias pyrene* (Linnaeus). 1. Kathmandu. 2. Sikkim. 3. Darjeeling. 4. Teesta. 5. Bhutan. 6. Khasi Hills. 7. Assam. 8. Manipur. 9. Nagaland. 10. Mishmis Hills. 11. Angpawng Bum. 12. Myitkyina. 13. Bhamo. 14. Doi Pa Hom Pok. 15. Chiang Dao. 16. Samoeng. 17. San Sai. 18. Wang Lung. 19. Mae Mo. 20. Doi Chang. 21. Mae Tha. 22. Wang Chin. 23. Namtok Mae Kam. 24. Pua. 25. Karen Hills. 26. Moulmein. 27. Umphang. 28. Tanasserim. 29. Padeng. 30. Kampuang. 31. Sa Nangmanora. 32. Namtok Kathu. 33. Namtok Ton Nga Chang. 34. Thale Ban. 35. Namtok Than To. 36. Namtok Nam Di. 37. Nam Ha. 38. Doi Pee Ban Nam. 39. Ban Nakha. 40. Ban Na Ruwang. 41. Vang Vieng. 42. Ban Nok. 43. Ban Nam Hom. 44. Xam Neua. 45. Cuc Phuong. 46. Than Moi. 47. Lak Sao. 48. Annam. 49. Nakai. 50. Ban Lao. 51. Nomtok Wairushi. 52. Ban Baitiang. 53. Phu Huu. 54. Sui Hiep. (●: *I. p. latifasciata*. ○: *I. p. verna*. ■: Intermediates between sspp. *latifaciata* and *verna*).

1 ♀ (syntype of *annamitica*); labeled "Jns. Bay Miu, Jannar, H. Fruhstorfer" (BMNH).

Distribution. Southern Myanmar, Central and Southern Thailand, Northern Malaysia, Central Laos, Southern Vietnam.

Intermediates between *latifasciata* and *verna*

Specimens examined. LAOS—Kham Muan Province, Ban Lao: 1 ♂, 23. iii. 1995 (N); 5 ♂ 1 ♀, 2. iii. 1998 (N). Kham Muan Province, Nakai: 3 ♂, 9. vi. 1999 (N). Cham Pasak Province, Ban Baitiang: 13 ♂, 29. iii. 1996 (N). Cham Pasak Province, Namtok Wairushi: 9 ♂, 23. iii. 1996 (N). Cham Pasak Province, Huai Nam Chang: 1 ♂, 26. iii. 1996 (N).

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Ixias pyrene alticola Pendlebury, 1933 (Figs 47, 48)

Ixias ludekingi alticola Pendlebury, 1933, *J. fed. Malay St. Mus.* **17**: 383; Corbet & Pendlebury, 1934, *Butterflies Malay Peninsula*: 102, pl. 4, figs 40–41.
Ixias pyrene alticola: Gabriel, 1943, *Proc. R. ent. Soc. Lond.* (B) **12**: 64; Yata, 1981, *in* Tsukada, *Butterflies South East Asian Islands* **2**: 280, pl. 22. (Figs 47, 48)
Ixias alticola: D'Abrera, 1982, *Butterflies Oriental Region* **1**: 164.

Specimen examined. MALAYSIA—1 ♂ (syntype of *alticola*), labeled "Pahang, F. M. S., Lubok Tamang, 3500 ft., 24th June, 1923, H. M. Pendlebury." (BMNH).

Distribution. Malay Peninsula.

Ixias pyrene birdi Distant, 1883

Ixias birdi Distant, 1883, *Ann. Mag. nat. Hist.* (5) **12**: 351; D'Abrera, 1982, *Butterflies Oriental Region* **1**: 164.
Ixias pyrene birdi: Corbet & Pendlebury, 1934, *Butterflies Malay Peninsula*: 102; Gabriel, 1943, *Proc. R. ent. Soc. Lond.* (B) **12**: 64; Yata, 1981, *in* Tsukada, *Butterflies South East Asian Islands* **2**: 280, pl. 22.

Specimen examined. MALAYSIA—Perak State, 19 mile: 1 ♂, iv. 1999 (N).

Distribution. Malay Peninsula.

Ixias pyrene evippe (Drury, 1773 ["1770–1772"]) (Figs 49–54)

Papilio evippe Drury, 1773 ["1770–1772"], *Illust. nat. Hist.* **1**: 11, pl. 5, fig. 2.
Ixias evippe Kirby, 1871, *Synon. Cat. diurnal Lepid.*: 498.
Ixias pyrene evippe: Yata, 1981, *in* Tsukada, *Butterflies South East Asian Islands* **2**: 280.
Ixias watti Butler, 1880, *Proc. zool. Soc. Lond.* **1880**: 151, pl. 15, fig. 1.
Ixias dharmsalae Butler, 1880, *Proc. zool. Soc. Lond.* **1880**: 150, pl. 15, figs 8–9.
Ixias pygmaea Moore, 1882, *Proc. zool. Soc. Lond.* **1882**: 254, pl. 12, fig. 1. (Figs 53, 54)
Ixias pyrene pirenassa f. *pygmaea*: Fruhstorfer, 1910, *in* Seitz, *Gross-Schmett. Erde* **9**: 159.
Ixias kausala Moore, 1877, *Ann. Mag. nat. Hist.* (4) **20**: 49. (Figs 49–52)
Ixias pyrene kausala: Gabriel, 1943, *Proc. R. ent. Soc. Lond.* (B) **12**: 58.
Ixias pyrene pirenassa f. *kausala*: Fruhstorfer, 1910, *in* Seitz, *Gross-Schmentt. Erde* **9**: 159, pl. 71, row d.
Ixias satadra Moore, 1877, *Ann. Mag. nat. Hist.* (4) **20**: 50.

Specimens examined. INDIA—1 ♂ (syntype of *pygmaea*), labeled "Kangra (Himachal Prad. India), 82. 25" (BMNH). 1 ♂ 1 ♀ (syntype of *kausala*), labeled "Kussowlie, N. W. Himalaya, Moore Coll., 1908-208." (BMNH).

Distribution. Northern and Central India.

Papilio evippe Drury, 1773 has been said to be a junior primary homonym of *Papilio euippe* Linnaeus, 1758, because the latter had once been spelled as *Papilio evippe* auct. by unjustified emendation or merely subsequent incorrect spelling (Bridges, 1988). At present, I have no evidence that the change was indeed by unjustified emendation, and here I use *evippe* Drury for this taxon. If Drury's *evippe* is a junior homonym, then *Ixias satadra* Moore, 1877 becomes valid. Moore's *satadra* and *kausala* were published in the same paper, and Evans (1932) later listed this taxon as "*pyrene satadra* (= *dharmasalae, watti, kausala, pygmaea*)". This act by Evans (1932) is in truth considered as the first reviser's act according precedence to *satadra*, sinking *kausala* as a junior subjective synonym of that name, in these two

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nominal taxa.

Ixias pyrene sesia (Fabricius, 1777)

Papilio sesia Fabricius, 1777, *Gen. Ins.*: 257.
Ixias sesia Butler, 1869, *Cat. Fabr. Lepid.*: 217; D'Abrera, 1982, *Butterflies Oriental Region* **1**: 164.
Ixias pyrene sesia: Gabriel, 1943, *Proc. R. ent. Soc. Lond.* (B) **12**: 58; Talbot, 1947, *Fauna Br. India* (Butterflies) **2** (Edn 2): 445; Watkins, 1923, *Entomologist* **36**: 208; Yata, 1981, *in* Tsukada, *Butterflies South East Asian Islands* **2**: 280.
Ixias pirenassa Wallace, 1867, *Trans. ent. Soc. Lond.* (3) **4**: 395, pl. 9, fig. 4.
Ixias frequens Butler, 1880, *Proc. zool. Soc. Lond.* **1880**: 151, pl. 15, figs 6–7.
Ixias ganduca Moore, 1884, *J. Asiat. Soc. Beng.* **53**: 29.
Ixiax colaba Swinhoe, 1885, *Proc. zool. Soc. Lond.* **1885**: 142, pl. 9, figs 3–4.
Ixias jhoda Swinhoe, 1885, *Proc. zool. Soc. Lond.* **1885**: 142, pl. 9, fig. 6.
Ixias alana Swinhoe, 1890, *Ann. Mag. nat. Hist.* (6) **5**: 357.
Ixias pyrene cingalensis, f. *connectens* Fruhstorfer, 1910, *in* Seitz, *Gross-Schmett. Erde* **9**: 159, pl. 71, row d. [*recte* S. India teste by Gabriel, 1943: 58]. Unavailable by an infrasubspecific name.
Ixias pyrene cingalensis, f. *nivescens* Fruhstorfer, 1910, *in* Seitz, *Gross-Schmett. Erde* **9**: 159, pl. 71, row d. [*recte* S. India teste by Gabriel, 1943: 58]. Unavailable by an infrasubspecific name.

Specimens examined. INDIA—Tamil Nadu State, Nilgiri Hills: 4 ♂, x. 1996 (N).

Distribution. Southern India.

Ixias pyrene cingalensis Moore, 1881

Ixias cingalensis Moore, 1881, *Lepid. Ceylon* **1**: 126, pl. 50, figs 2, 2a (♂♀); D'Abrera, 1982, *Butterflies Oriental Region* **1**: 164.
Ixias pyrene cingalensis Fruhstorfer, 1910, *in* Seitz, *Gross-Schmett. Erde* **9**: 159, pl. 71, row d; Gabriel, 1943, *Proc. R. ent. Soc. Lond.* (B) **12**: 57; Talbot, 1947, *Fauna Br. India* (Butterflies) **2** (Edn 2): 444; Yata, 1981, *in* Tsukada, *Butterflies South East Asian Islands* **2**: 280; D'Abrera, 1998, *Butterflies Ceylon*: 86.

Distribution. Sri Lanka.

Ixias pyrene andamana Moore, 1877

Ixias andamana Moore, 1877, *Proc. zool. Soc. Lond.* **1877**: 590.
Ixias verna andamana: Bingham, 1907, *Fauna Br. India* (Butterflies) **2**: 195.
Ixias pyrene andamana: Fruhstorfer, 1910, *in* Seitz, *Gross-Schmett. Erde* **9**: 159; Gabriel, 1943, *Proc. R. ent. Soc. Lond.* (B) **12**: 61; Talbot, 1947, *Fauna Br. India* (Butterflies) **2** (Edn 2): 449; Yata, 1981, *in* Tsukada, *Butterflies South East Asian Islands* **2**: 280, pl. 22.
Ixias lena Swinhoe, 1890, *Ann. Mag. nat. Hist.* (6) **5**: 357.

Specimens examined. INDIA—Andaman: 1 ♀, 7. iv. 1991 (N); 3 ♂, 24–29. xii. 1991 (N).

Distribution. Andaman.

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to examine the specimens including types in their museum.

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摘　　要

東南アジア大陸部を中心としたメスジロキチョウの再検討 (西村正賢)

インドからインドシナ，マレーシア，中国南西部のメスジロキチョウ，*Ixias pyrene* (Linnaeus) について再検討を行った．現在までの資料をもとにすると 10 亜種に分類できた．これまで使用されてきた *Ixias pyrene yunnanensis*, *I. pyrene fruhstorferi* は *I. pyrene latifasciata* の，そして *I. pyrene annamitica*, *I. pyrene salangana* は *I. pyrene verna* のシノニムとして処理した．また，*latifasciata* と *verna* がインドシナ地域において同所的に生息することを確認し，現状を紹介した．

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